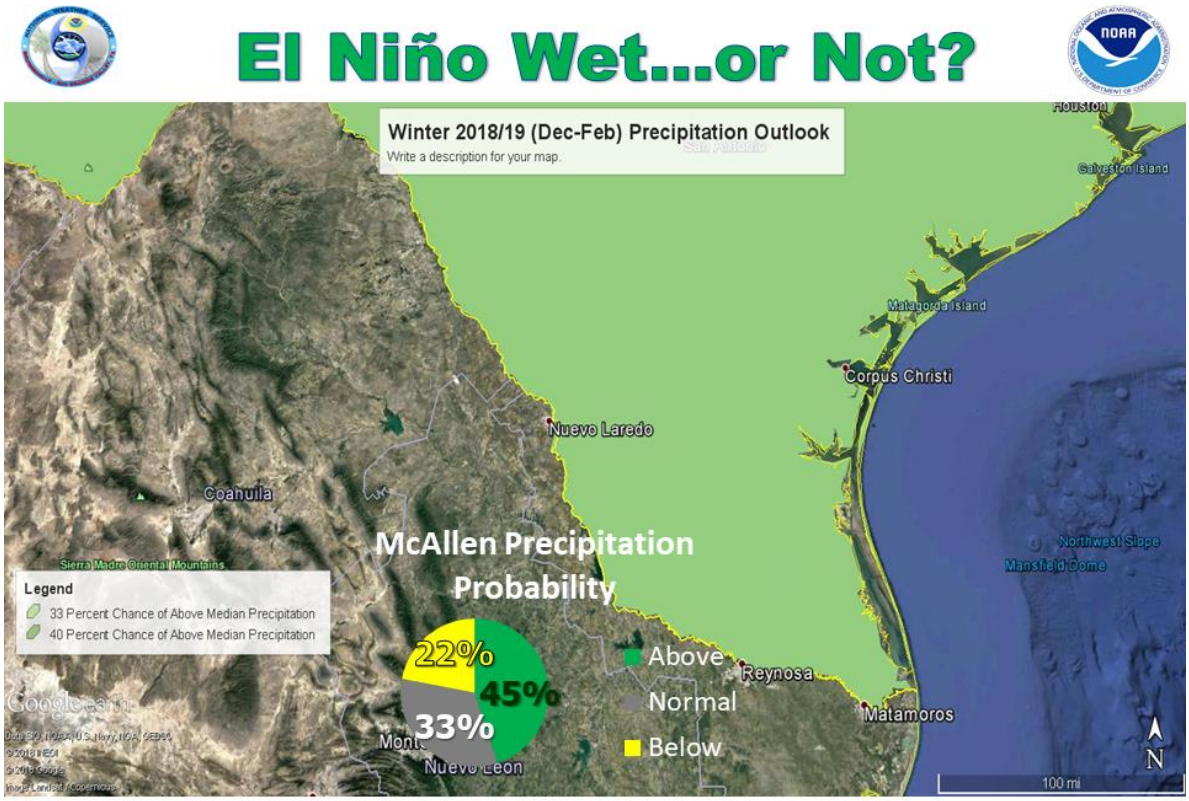
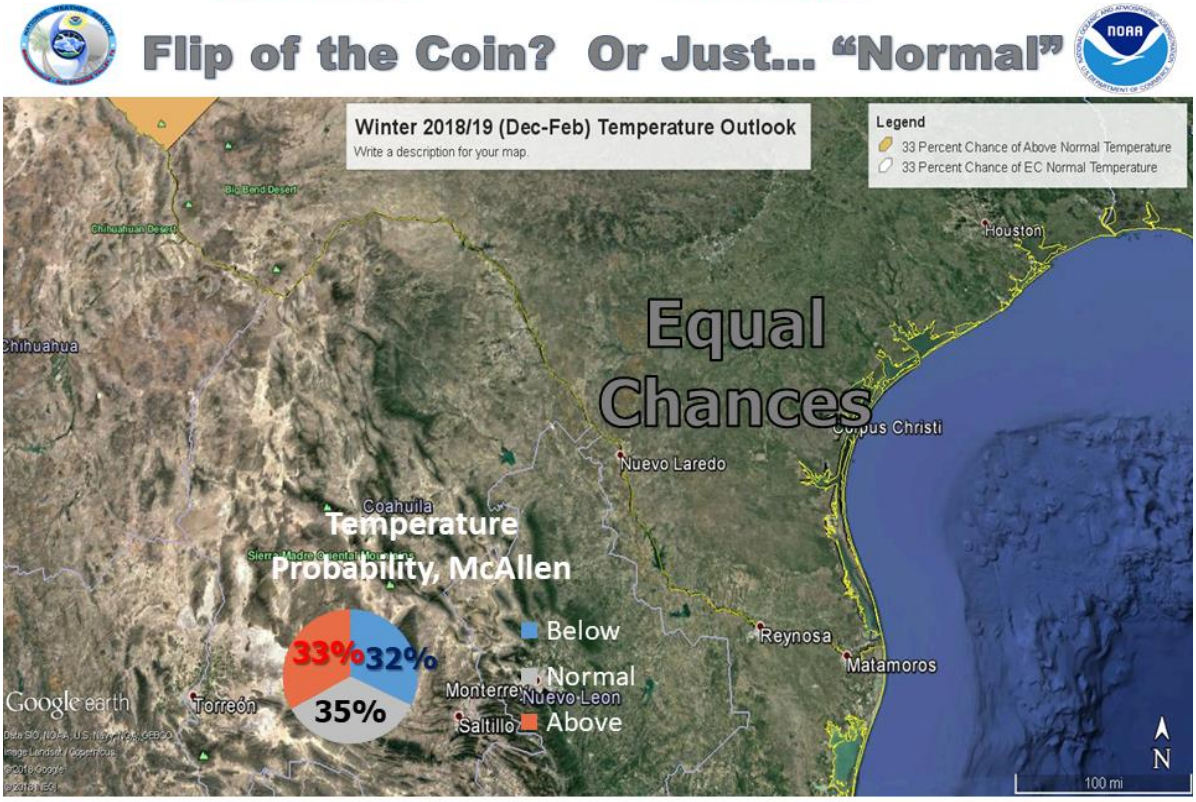
RGV Winter 2018-2019 Outlook



Note: Average Precipitation for Period (RGV): 3 inches along the Rio Grande (Starr, SW Hidalgo); 3.5 to 4 inches elsewhere except 4 to 4.5 inches Along the Coast.



Note: Average Temperature For Period (RGV): Approximately 63°F Afternoon: ~73°F, Wake-Up: ~53°F.

As Confident as a Coin Flip?

Uncertainty Reigns for December to February in the Rio Grande Valley

"Up and Down" Temperatures Likely; Enough Rain to Keep Drought Away

Overview

As November 2018 headed toward a close, the last gasp of summer like temperatures that reappeared during the first week of the month was slammed shut by a record-breaking early season true "Blue 'Norther" by mid-month. The earliest widespread Valley freeze since October 31, 1993, occurred on November 14th, with low temperatures ranging from the upper 20s to mid 30s in most locations with new daily records falling at McAllen, Harlingen, Port Mansfield, and Rio Grande City, among others. Temperatures, which had averaged 3 to 5 degrees above normal on the 8th, flipped the other direction courtesy of a week-long stretch of values between 10 and 20+ degrees below normal. As of November 18th, the monthly averages were running roughly 3 to 5 degrees ***below*** normal. Expected trends of slightly below average temperatures to close November ensured that the month would be the first month since January (2018) to end up several degrees below normal.

The cool November, combined with a slightly below average October and a warm September, may leave meteorological autumn (September to November) running very close to average overall. As for rainfall? The "Wet-Tember" and slightly drier than average October and what looked to be a similar result in November would leave autumn a shade above average for the populated Valley, but still well above average for the ranchlands, which had between 15 and 22+ inches in September – up to four times the average in some locations.

What about winter 2018/2019? While a weak to moderate El Niño was getting underway, and expected to continue through the heart of winter (below), uncertainty was higher than usual on how the season would unfold – namely, how often would sufficient moisture be available to produce rainfall to push totals above the seasonal average of 3 to 4.5 inches? Temperature forecasts were equally as difficult. Initial thinking for the long-lead winter outlook was for above average temperatures to continue, though with much less certainty. Trends that began in October – with already two (and possibly three) day to day "sharp" temperature drops (generally defined as the difference from mid afternoon to mid afternoon of 30˚F or more) having occurred before December 1st – could produce several more such changes through winter. A "low index" steering pattern (Figures 1 and 2) that limits the potential for prolonged stretches of warm, humid weather, at least through early February would also be key to how the final average values would end up (below average in this case).

Last but not least, even if the overall winter ends up with temperatures around or slightly above average, the memory of the season will be dictated by the number of sharp cooldowns, freezes/frosts, and even wintry precipitation. Such was the case for 2017/2018, where **three** wintry precipitation events occurred following three of the seven sharp to near-sharp cold snaps in some areas (Weslaco, Harlingen). With one freeze and a follow-up frost behind us – as well as pockets of "conversational" ice pellets on November 13th – some memories of the "winter" of 2018/19 may already be setting up.

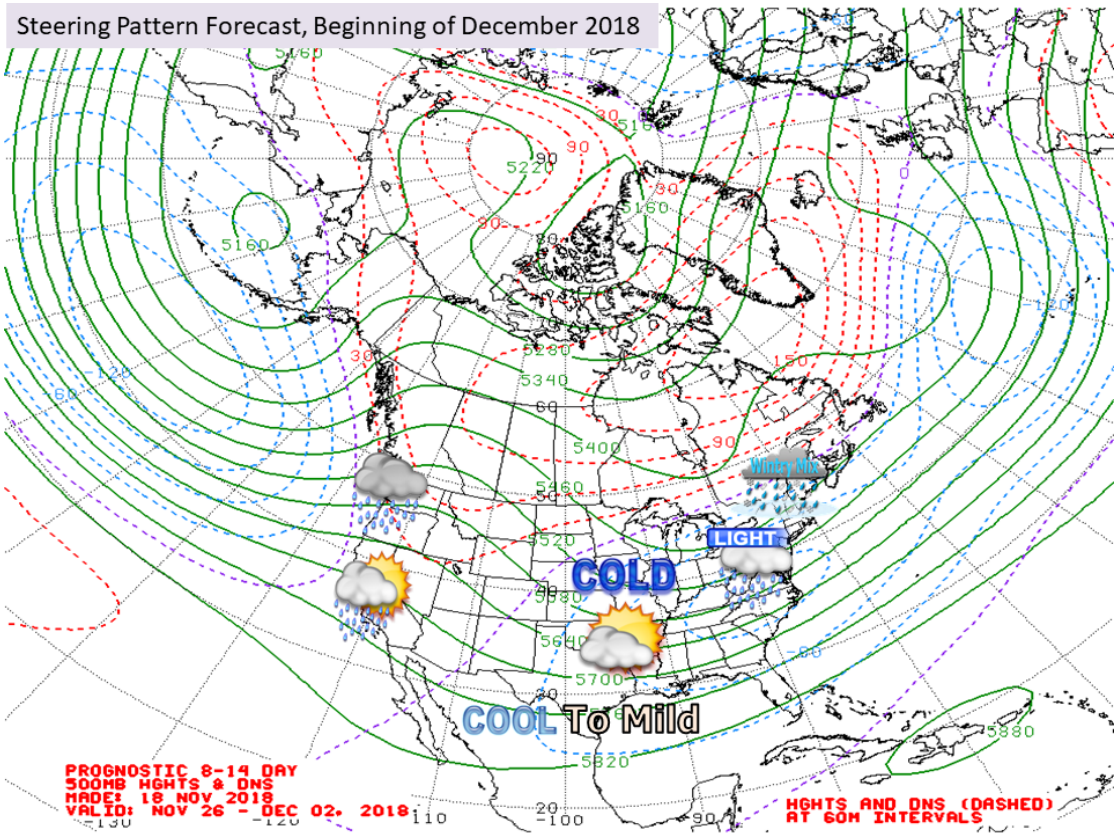


Figure 1: The atmospheric steering pattern (~18,000 feet) continues to feature progressive westerly flow across the entire U.S., with a forecast "lean" toward more troughing from the Great Plains to the east coast with a weakening western U.S. high pressure ridge. This pattern favors flip-flopping temperatures in south Texas, with several days of cooler than average readings (60s by day or lower) followed by a couple of warmer to much warmer days (80 or warmer).

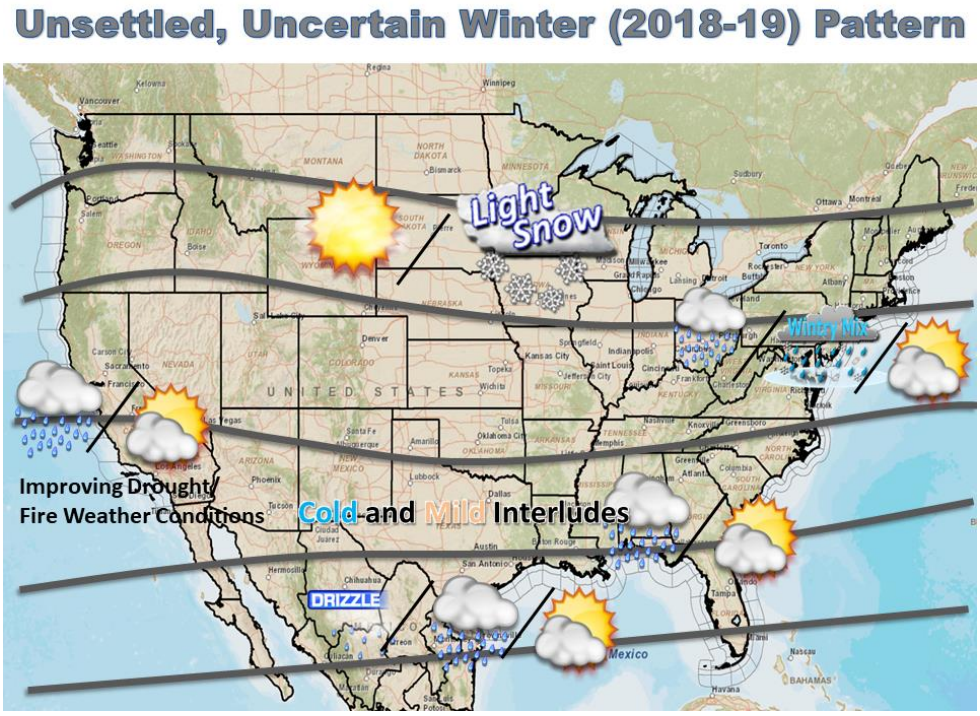


Figure 2. Potential mean steering pattern at 500 mb (~18,000 feet) for the USA during winter 2018/19. Uncertainty is dominant on both the pattern and location/duration of individual elements with it.

Pattern Matters
Zonal (West to East) Flow Means Frequent Changes

- A mix of "gray" (more likely) and "blue" (infrequent but occurring) 'northers is expected to be at a fairly quick 'rhythm' through at least early February
- The Arctic Oscillation (AO) and North Atlantic Oscillation (NAO) faded from positive (+NAO, +AO) to neutral phase in October and November. Signs of somewhat prolonged negative phase (-NAO, -AO) were showing up in late November, but predictability beyond two weeks remains poor.
    - A neutral to +NAO/AO would favor a lower chance for true polar (arctic) air masses, reducing the possibility of additional freezes or winter precipitation
    - A –NAO/-AO would increase the chance for polar (arctic) air masses to surge from western Canada southward deep into Mexico, as was the case in mid-November and several times in December 2017/January 2018.
    - Should a few periods of –NAO/-AO develop, between one and three additional freezes are possible, along with one wintry precipitation event – even if "conversational" only
- While the probability of above average rainfall is higher than below or "normal", much will depend on the ultimate position and duration of atmospheric pressure systems in the southwest U.S. and northwest Mexico. Current indications, as well as occasional autumn trends, suggest eastern Pacific tropical "taps" to provide several rain events (light to moderate). However, should a pattern that aided the rapid and deadly spread of California wildfires in early to mid-November dominate winter, Valley rainfall could fall below average. Confidence is **low** for both possibilities with this season's forecast.

Teleconnections: El Niño Near Certain for the Period. The rest? Uncertain!
Eastern tropical Pacific water temperatures continued to maintain a solid warm nose (Figure 3) that began slowly last spring, increased a bit in summer, and increased more markedly in September and October. All Niño regions were warmer than normal, with the Niño 3+4 region well above the critical index value of 0.5. The latest forecast (Figure 4) matches nicely with the persistence of downward Kelvin Waves (Figure 5). The latest forecast from NOAA's Climate Prediction Center shows an 80+ percent likelihood of El Niño conditions through winter, gradually dropping off during spring 2019. Note that an El Niño segment requires an Oceanic Niño Index (ONI) of +0.5 or higher for a consecutive three month average (i.e. "October to December"). The first of those segments is expected to be completed in November (September-November); five consecutive three-month averages of ONI of +0.5 or greater completes an El Niño cycle. There is high confidence that the ONI will continue at or above +0.5 through January-March, 2019.

As the winter of 2015/2016 showed, a moderate to strong El Niño is just an "800 lb. gorilla" in the medium range climate system. "Monkeys with wrenches" can appear and change expectations. In 2015/16, a persistent atmospheric high pressure ridge along and west of southern California and Baja California shunted deeper moisture producing events into the central/southern Rockies and central/south central Great Plains, while drier air moved across northern Mexico and compressed further on approach the northeast Mexico and Deep South Texas/Rio Grande Valley. A forecast of more than 60% likelihood of above average rainfall ended up solidly ***below*** average that winter. For 2018/19, the forecast is a 45% probability of above average rainfall with a 22% probability of below average rainfall (McAllen as proxy). But confidence in this forecast is low to medium. In autumn 2018, we saw some indications of a tropical "tap" of eastern Pacific and Bay of Campeche moisture (October) from an active, though brief, subtropical jet stream. Conversely, the pattern that aided the devastating Santa Ana winds and unfortunate deadly California wildfires spread dry (though chilly to cold) air to the Rio Grande Valley.

Trends in other teleconnection patterns, such as the NAO, AO, PDO, and Pacific-North American (PNA), have been difficult to pin down this autumn. As mentioned above, AO/NAO had a prolonged period of positive phase before slipping to neutral and perhaps showing a period of negative to begin December. The Pacific Decadal Oscillation (PDO) has been sitting on "neutral" after a prolonged positive phase that ended in early 2017. The PNA, whose positive phase can sometimes be related to the wintertime negative phase of the NAO, has shown a lean toward positive since mid October – a phase that would favor more cold outbreaks and lower rainfall potential.

The “lean” for 2018/19 is toward at least “average” rainfall based on the lack of persistence of the eastern Pacific (non-tropical) – California/Baja ridge. Should split flow allow tropical moisture to overrun additional cool/chilly airmasses (i.e. “gray” ‘northers), the winter will be remembered for its clouds and occasional rain events. The equal chances for temperatures makes sense given the bi-polar personality of the atmosphere so far since early October – from record heat to start October to a record 10-day stretch of temperatures failing to reach 80 degrees (in October), followed by a top-ten warmest eight day start to November, then by record cold and a freeze on the 14th. Without a defined teleconnection trend to enhance any effect of El Niño, we’ll keep the idea of highly changeable weather through the winter as the storyline.

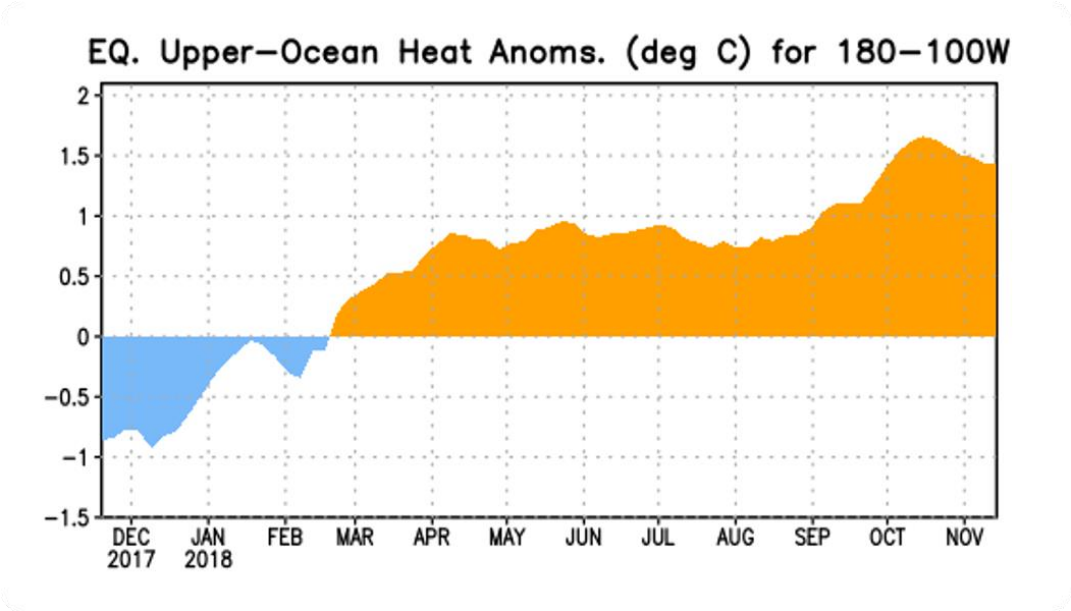


Figure 3: Upper oceanic heat content in the ENSO zone (generally equator to 5˚N or so latitude) continued to remain solidly in the ONI El Niño range (+0.5 or higher) through November, and the first three-month (September-November) period of such values was certain, and would be the start of an El Niño episode.

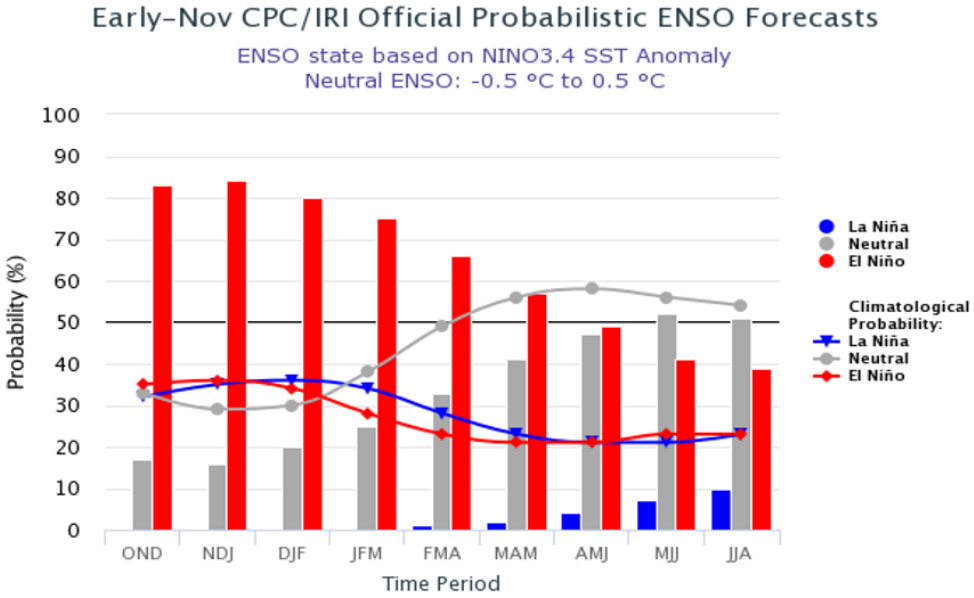


Figure 4: Multi-model consensus forecasts improved the probability of a five or six period (short) La Niña episode through early spring 2019.

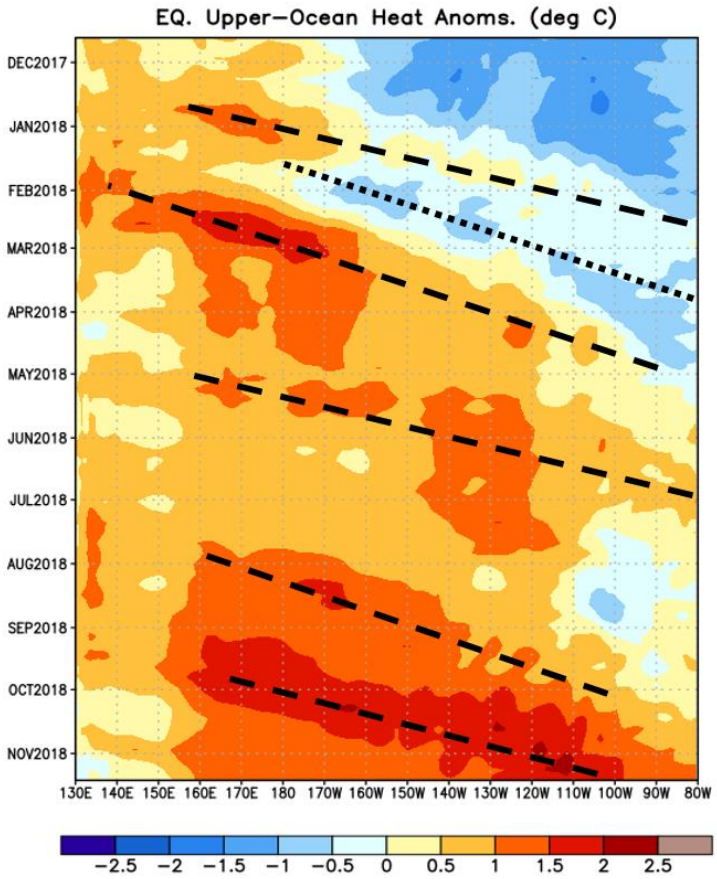


Figure 5. 12 month Kelvin wave trends (since Dec. 2017). Cool, upwelling producing waves through early 2018 were quickly replaced with warm, downwelling waves for the last half of 2018. Persistence of the downwelling (warming) waves since summer indicates increasing likelihood of an El Niño event.

What to Watch For: Changeable Weather through Winter

Overall, for the end of autumn and the first half of winter, the following situations are expected to predominate:

- *Warm to Cold to Warm to...*The presence of fast moving westerlies with occasional "buckles" across the Plains, headed toward the eastern seaboard, decreases the likelihood of any prolonged warm or cool/cold pattern. The presence of a positive PNA with a negative NAO/AO would increase the likelihood of stronger and more frequent cold air outbreaks; the absence of a positive PNA with a neutral or positive NAO/AO would decrease the likelihood of stronger/more frequent cold air outbreaks – but fronts, both gray and blue 'northers, would still reach the Valley with some frequency.

- *Freezing/Frozen Precipitation?.* The winter of 2017/2018 featured **three** separate winter precipitation events in parts of the Rio Grande Valley (December 8, snow; January 2, localized ice, January 16-17, ice) and already in November 2018, several reports of ice pellets (sleet) with no impact were received on the 13th. An October version of winter's McFarland upper level flow pattern provided a rare strong high pressure that dropped from the foothills of the Rockies all the way to northern Mexico, with light rain adding to the sharp change. With El Niño in the background, a period of-NAO/-AO and +PNA, especially if occurring from mid December through late January, could be sufficient for a second consecutive winter with notable and impactful precipitation in the Valley. On average, the region is impacted about every three winters with ice or sleet – but this winter offers the opportunity.

  Conversely, any prolonged +NAO/AO and –PNA with the weak to moderate El Niño would shunt any necessary cold air masses well north. While fronts would still pass, they would be milder (40s and 50s) and not anywhere close to sufficient for freezing or frozen precipitation.

- *Drought.* September's heavy rainfall cleared out all of the drought and dry conditions across the Rio Grande Valley and Deep S. Texas ranchlands. A mix of "gray" and "blue" 'Northers combined with low evaporation rates would keep any drought/dry conditions away. However, as the mid November freeze/cold/dry front showed, rangeland grasses can cure (dry out) quickly. Should "blue" rather than "gray" 'northers dominate, additional light (or moderate) freezes would affect the region, accelerating drying despite low evaporation rates. Abnormally dry conditions could arrive by February in this case – but note that monthly rainfall averages are low in winter, so it would take a combination of dry "cold" fronts in December and January with dry fronts with mild to warm air in February to bring these conditions. This is an unlikely scenario for this winter.

Outlook: Winter 2018/2019

December and January favor a continuation of highly changeable weather, with just enough of a subtropical jet stream to bring a few periods of precipitation to keep totals near the expected values (2 to 3 inches for the 62-day period). The development of any persistent +/-NAO (or AO) and +/- PNA will be key to how the heart of winter 2018/2019 is remembered. Snowpack (or lack of) in the southern and central Rockies, as well as the Great Plains, could well influence how little (or much) temperatures modify as fronts sweep southward. The following possibilities are each in play, with low confidence for each:

- *+PNA/-NAO(AO):* One to three more partial or Valley-wide freezes. Possibility that one of these would be a "hard" freeze (2 or more hours of 27 degrees or lower for half a forecast zone or half a forecast zone's population), with best possibility of the hard freeze from Dec. 20 through Jan. 10. One freezing or frozen precipitation event with minor impact. An additional 4 to 6 trackable cold fronts; two to four which could feature sharp (30+ degree day to day) drops. Overall temperature below average; precipitation at or just below average.
- *-PNA/+NAO(AO):* No additional freezes or frosts. Fronts would almost exclusively be "gray" 'northers and coldest situation would be 40s and 50s, with a likelihood of 2 to 4 additional fronts in total. When combined with an active subtropical jet stream, rainfall would be solidly above average. When combined with a "mixed" jet stream, rainfall would be near or below average.

February will also depend on how other teleconnections can link up with El Niño. A continuation of +PNA/-NAO (trends) would allow another one or two fronts to arrive; early month fronts could be strong and a freeze or ice (precipitation) event could not be ruled out. A neutral PNA/NAO(AO) or –PNA/+NAO(AO), if combined with an active subtropical jet, could increase the opportunity for heavier rainfall as well as a chance for mid to late month severe weather in the form of hail, damaging winds, and possible tornadoes.

Preparedness, Awareness

The forecast is high confidence for changeable weather - which is medium to high confidence for one or more significant impacts. But low confidence in exactly which impacts those will be! Below are shown the impacts one should keep in the "better safe than sorry" back of the mind category for Winter 2018/19.

- ***Cold, Chill…A(nother) Freeze?*** The "wildcards" mentioned above could bear fruit from mid December through early February. The freezing/near freezing temperatures of November 14 and 15, following up from multiple cold/freeze events in Winter 2017/2018, to keep our collective eyes open for more this winter, especially in December and January.
    - Keep your cool weather clothes nearby, and be prepared to have them on hand if/when sharp cold fronts arrive. 30 to 50 degree "feels like" temperature drops – literally from summer to winter temperatures - have occurred several times in Decembers' past.
    - If you have tender tropical vegetation, set aside blankets and light coverings by the end of November to be ready in case freeze warnings are issued during December and January
    - Keep your vehicle checked for the following:

        - Brake pads/shoes – always important on rain-slick roads after dry spells; light rain behind cold fronts after prolonged dry weather can be especially dangerous
        - Windshield wipers/blades – dry rotting is common here, so frequent replacement ensures visibility.
        - Tires. Check tread wear and inflation pressures frequently, and repair/replace/inflate as necessary
        - Coolant. Anti-freeze is a necessity in both summer and winter, and sharp weather changes can cause stress on older vehicles' cooling systems. Change as needed
        - Battery. Summer heat, humidity, salt air wear down batteries here more than most other places in the country. A cold snap could add further stress and the last thing you'd want is a stalled vehicle on a very cold day.
    - Keep the Elderly and Infirm in mind. Sharply cold weather can be taxing and even injurious on those acclimated to our semi-tropical climate. If you have family or friends with no heating capability, be sure to educate them on home safety – i.e. small heating units or space heaters – well before the cold arrives.

- ***Flooding Rain***. November 2018 will be remembered for its early heat, mid month freeze/frost, and drizzly in between. December and January may follow suit, but if additional cold snaps render the grass and soil dormant and prone to rapid runoff, ***February*** could become interesting if the subtropical jet stream gets active and pulls deeper tropical-sourced moisture to the Rio Grande Valley as average temperatures (and humidity) begins to rise headed into spring. Winter floods will not rival impact seen in June and September 2018, but urban flooding of a few feet of water depth has occurred in February's past. Stay flood prepared all year round!

- ***Hail, Damaging Wind…Tornadoes?*** Probabilities are slim to none for severe weather through January 2018, though one can never rule out the rogue or rare event given the Valley's proximity to the true tropics and plenty of warm and humid low level air. By February, that could change if the combination of an active subtropical jet links up with mid latitude mid level westerlies and pulls up increasingly warm/humid/unstable air from a slowly warming southwestern Gulf of Mexico. Hail, damaging winds, and tornadoes have struck Texas in February during El Niño winters; notorious and deadly tornadoes have ravaged parts of Florida during El Niño Februarys, most notably in 1998 but again in 2007. Take advantage of December and January to build resiliency to your home, including roofs, walls, windows, doors, and garages. Details on home severe weather readiness can be found at the Federal Alliance for Safe Homes website.